Biodiversity and Monitoring Section Update

Black Sturgeon River – lake sturgeon *(Acipenser fulvescens)* larval drift assessment update

Survey: May 5–July 7, 2015
Gear: 7 drift nets set overnight
Hobo Water Temperature Pro v2 data logger

Objectives

1. Estimate the number of breeding adults in the Black Sturgeon River downstream of the Camp 43 dam. Aquatic Research and Monitoring Section, Science and Research Branch, OMNRF, will analyze the larvae collected using the parental assignment software COLONY (Jones and Wang 2009).
2. Test the cumulative thermal unit (CTU) model (Friday 2014) by predicting lake sturgeon spawning dates and the period of larval drift using water temperature data and the equation developed by Kempinger (1988) (Appendix A).

Results

- During 30 overnight sampling events upstream of Highway 11–17, 54 fully developed lake sturgeon larvae were captured for genetic analysis (Figure 1, Appendix B).
- The predicted spawning date was May 28 based on water temperature (13.4°C) (Figure 2). This date was used to predict when larval drift would start (150 CTU from May 28) and end (400 CTU from May 28).
- Drift nets were deployed at 90.5 CTU to ensure the entire drift period was sampled. June 13 and 14 were the only days that nets were not deployed.
- The first fully developed larva (21 mm) was captured at 172.4 CTU (from May 28) on June 16 (Figure 3). Back calculating the CTU from the date when the first larva was captured, to the date when 150 CTU was attained, resulted in a predicted spawning date of May 31 (13.0°C).
- The last fully developed larva (20 mm) was captured at 430.4 CTU (from May 28) on July 7 (Figure 3). Using the back calculated spawning date (May 31) there were 408.8 CTU on July 7.
- Larvae ranged in length from 16 to 35 mm. The 35 mm sturgeon captured on July 5 (Figure 4) likely emerged from the substrate in mid-June, began exogenous feeding, and grew to this size by the time it was captured.
- Discharge during the larval drift period ranged from 47.4 to 34.7 $m^3 \cdot s^{-1}$ (Figure 5).

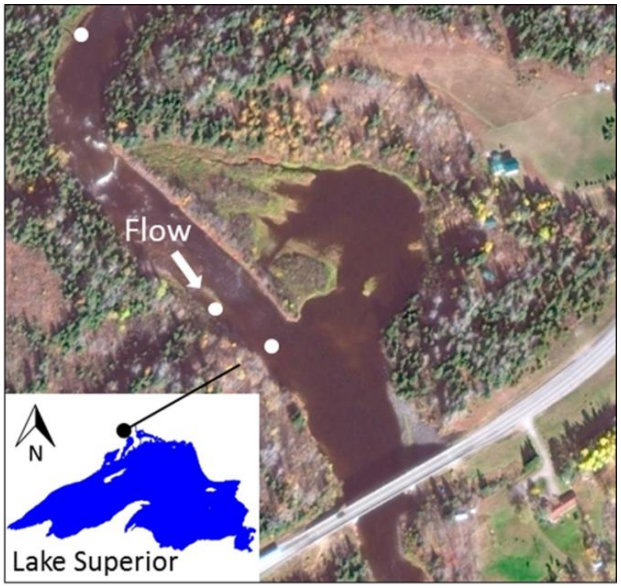

Figure 1. Location of the Black Sturgeon River and drift netting sites (white circles).

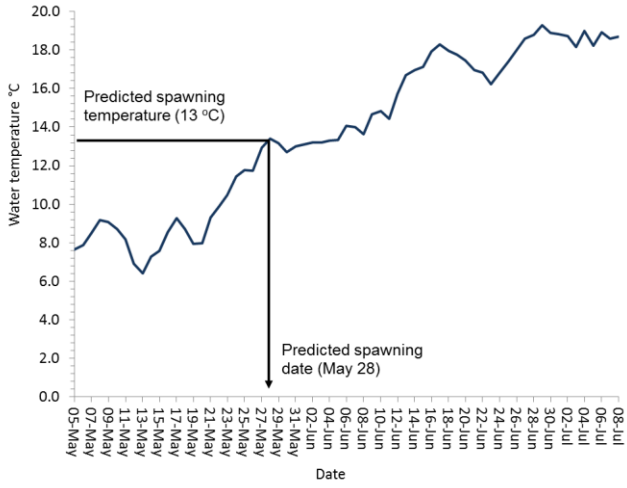

Figure 2. The predicted date of spawning (May 28) in relation to water temperature spawning requirement (13°C).

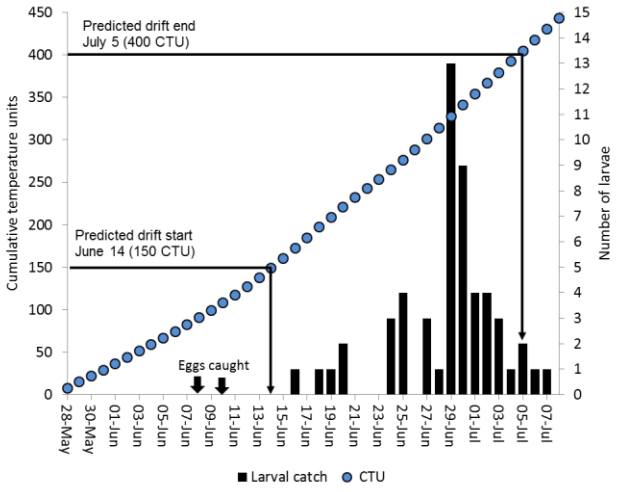

Figure 3. The catch of fully developed larvae (black bars) and predicted start (June 14) and end of larval drift (July 5) and associated CTU requirements.

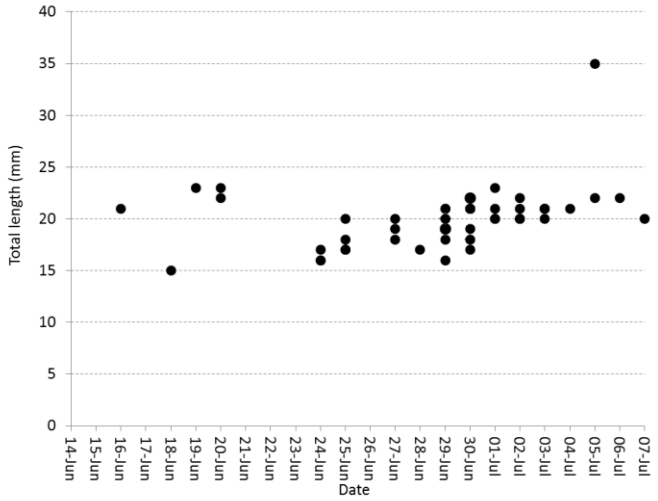

Figure 4. Total length of individual larval lake sturgeon captured on the Black Sturgeon River from June 16 to July 7, 2015.

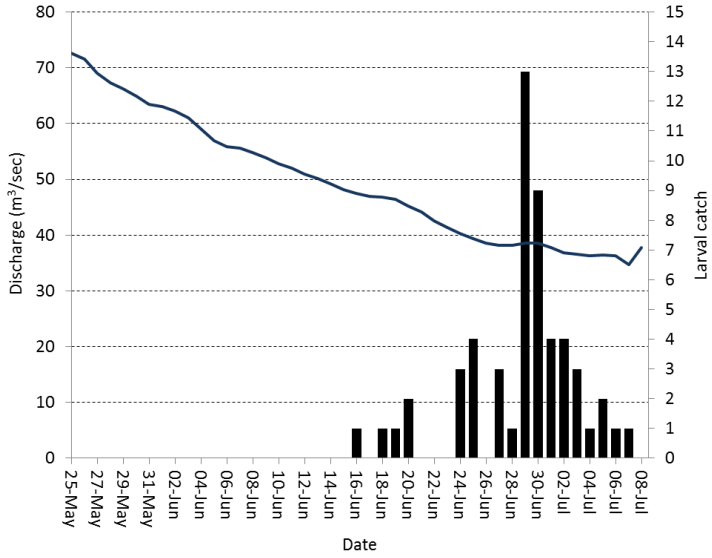

Figure 5. The catch of fully developed larvae (black bars) and discharge ($m^3 \cdot s^{-1}$).

Conclusions

- The CTU model developed on the Kaministiquia River accurately predicted the initial spawning date and the period of larval drift on the Black Sturgeon River.
- Lake sturgeon are spawning in the Black Sturgeon River and collected larvae are likely from a spawning event(s) downstream of the Camp 43 dam.
- Genetic samples from larval sturgeon were analyzed using 14 microsatellite loci. Based on the 2015 cohort, the number of breeding adults (Nb) in the Black Sturgeon River was 24 (14–44 95% CIs). There were eight full-sibling larvae (shared the same parents) and 201 half-sibling larvae (shared one parent) in the sample.

Dec 1, 2015

References

1. Friday, M.J. 2009. The migratory and reproductive response of spawning lake sturgeon to controlled flows over Kakabeka Falls on the Kaministiquia River, 2009. Min. Natur. Resour. Upper Great Lakes Management Unit – Lake Superior Technical Report 2009.01. 21 pp.
2. Friday, M.J. 2014. Estimating the critical reproductive periods of lake sturgeon (*Acipenser fulvescens*) using daily water temperature units. Ont. Min. Natur. Resour., Northwest Bio. & Mon., BAMS Technical Report TN-48. 7 pp.
3. Kempinger, J.J. 1988. Spawning and early life history of lake sturgeon in the Lake Winnebago system. Wisconsin. Pp. 110-122 in R.D. Hoyt, editor. 11th annual larval fish conference. American Fisheries Society, Symposium 5. Bethesda. Maryland.
4. Jones, O. and Wang, J. 2009. COLONY: A program for parentage and sibship inference from multilocus genotype data. Molecular Ecology Resources 10: 551-555.

Appendix A

Kempinger's CTU equation

$$\text{CTU} = \sum_{i=1}^{n} (x_i - K)$$

K = the constant, (5.8°C)

x_i = mean daily water temperature (°C) for day i

n = number of days from spawning to end of drift

Appendix B

- Only a small portion of the river was sampled where depth and velocity were low enough to permit safe drift net deployment.
- Drift nets were deployed as close to the thalweg as possible to maximize netting efficiency (Friday 2009).

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Ontario